

**A.5.2.2. For equipment powered by primary supply voltage**

According to the JTC standard the GSM frequency stability of the carrier shall be accurate to within 0.1ppm of the received frequency from the base station. And the WCDMA is 2.5ppm. This accuracy is sufficient to meet Sec.24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. For this EUT section 2.1055(d)(1) applies. This requires varying primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

**A.5.3 Test results****GSM850Mid Channel/fc(MHz) 189/836.4****Frequency Error VS Temperature**

Power Supply (VDc)	Environment Temperature(°C)	Frequency error(Hz)	Limit (Hz)
8	-30	-2.47	2091
8	-20	-2.32	2091
8	-10	-0.64	2091
8	0	-5.19	2091
8	10	-2.43	2091
8	20	-2.13	2091
8	30	0.48	2091
8	40	1.34	2091
8	50	-2.5	2091

**Frequency Error VS Voltage**

Power Supply (VDc)	Environment Temperature(°C)	Frequency error(Hz)	Limit (Hz)
6.6	25	-3.22	2091
8	25	-2.19	2091
8.4	25	-0.9	2091

**PCS1900 Mid Channel/fc(MHz) 661/1880****Frequency Error VS Temperature**

Power Supply (VDc)	Environment Temperature(°C)	Frequency error(Hz)	Limit (Hz)
8	-30	-2.41	4700
8	-20	0.42	4700
8	-10	-2.7	4700
8	0	-1.91	4700
8	10	-1.75	4700
8	20	-2.5	4700
8	30	-2.75	4700
8	40	-2.11	4700
8	50	-1.61	4700

**Frequency Error VS Voltage**

Power Supply (VDc)	Environment Temperature(°C)	Frequency error(Hz)	Limit (Hz)
6.6	25	-2.52	4700
8	25	-1.81	4700
8.4	25	-1.9	4700

**WCDMA BAND II Mid Channel/fc(MHz) 9400 /1880****Frequency Error VS Temperature**

Power Supply (VDc)	Environment Temperature(°C)	Frequency error(Hz)	Limit (Hz)
8	-30	0.69	4700
8	-20	-0.61	4700
8	-10	0.27	4700
8	0	-0.15	4700
8	10	0.2	4700
8	20	-1.3	4700
8	30	-0.58	4700
8	40	-1.21	4700
8	50	1.6	4700

**Frequency Error VS Voltage**

Power Supply (VDc)	Environment Temperature(°C)	Frequency error(Hz)	Limit (Hz)
6.6	25	-1.19	4700
8	25	-0.98	4700
8.4	25	-1.05	4700

**WCDMA BAND V Mid Channel/fc(MHz) 4183/836.6****Frequency Error VS Temperature**

Power Supply (VDc)	Environment Temperature(°C)	Frequency error(Hz)	Limit (Hz)
8	-30	-0.58	2091.5
8	-20	1.43	2091.5
8	-10	-0.56	2091.5
8	0	0.41	2091.5
8	10	2.21	2091.5
8	20	1.27	2091.5
8	30	0.29	2091.5
8	40	1.56	2091.5
8	50	-0.03	2091.5

**Frequency Error VS Voltage**

Power Supply (VDc)	Environment Temperature(°C)	Frequency error(Hz)	Limit (Hz)
6.6	25	2.85	2091.5
8	25	1.34	2091.5
8.4	25	-0.24	2091.5

**Conclusion: PASS**

**ANNEX A.7. CONDUCTED SPURIOUS EMISSION****A.7.1. GSM Measurement Method and test procedures**

The following steps outline the procedure used to measure the conducted emissions from the EUT.

1. Determine frequency range for measurements: From CFR 2.1057 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency. For the equipment of PCS1900 band, this equates to a frequency range of 30 MHz to 19.1 GHz, data taken from 30 MHz to 20 GHz. For GSM850, data taken from 30 MHz to 10 GHz.
2. The sweep time is set automatically by instrument itself. That should be the optimal sweep time for the span and the RBW. If the sweep time is too short, that is sweep is too fast, the sweep result is not accurate; If the sweep time is too long, that is sweep is too low, some frequency components may be lost. The instrument will give a optimal sweep time according the selected span and RBW.
3. The procedure to get the conducted spurious emission is as follows:  
The trace mode is set to MaxHold to get the highest signal at each frequency;  
Wait 25 seconds;Get the result.
4. Determine EUT transmit frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.

**GSM 850 Transmitter**

Channel	Frequency(MHz)
128	824.2
189	836.4
251	848.8

**PCS 1900 Transmitter**

Channel	Frequency(MHz)
512	1850.2
661	1880.0
810	1909.8

#### A.7.1.1. Measurement Limit

Part 24.238 and Part 22.917 specify that the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

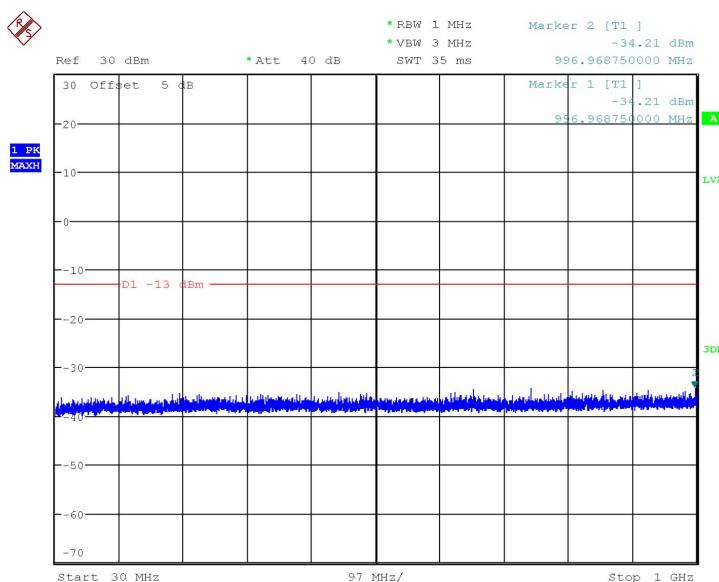
The specification that emissions shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log(P)$  dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

#### A7.1.2. Measurement result

**Spurious emission limit -13dBm.**

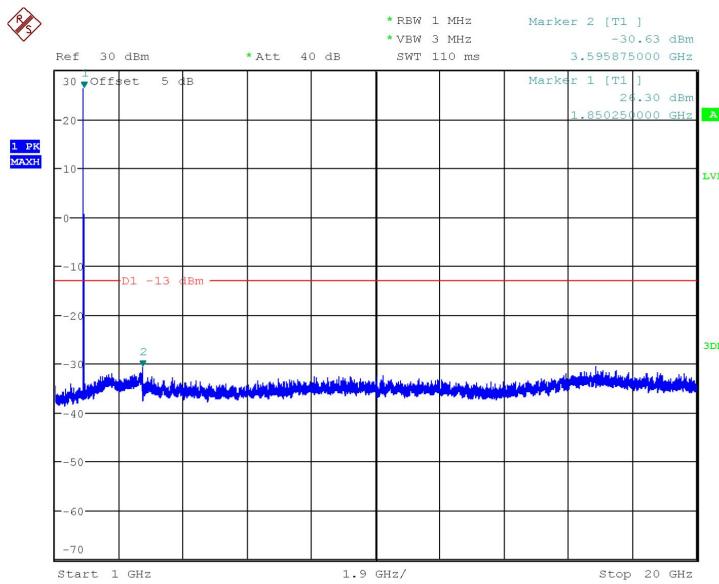
**Note: peak above the limit line is the carrier frequency.**

#### A7.1.2.1. GSM850



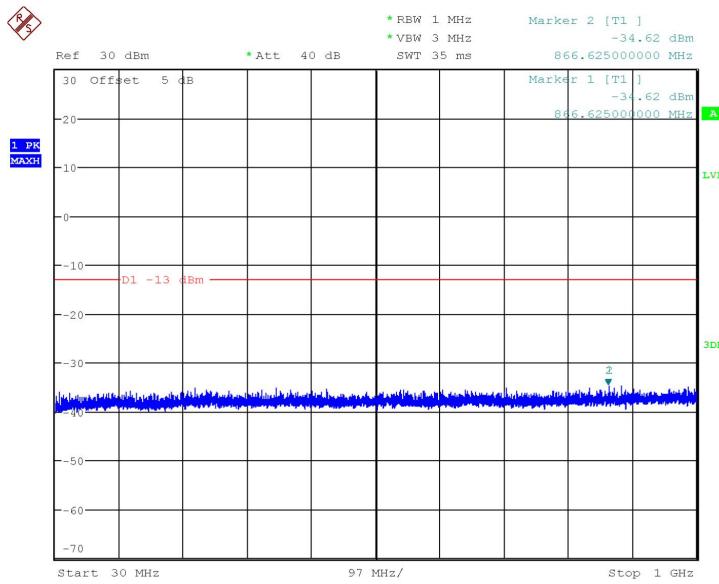
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**Channel 128: 30MHz~1GHz**



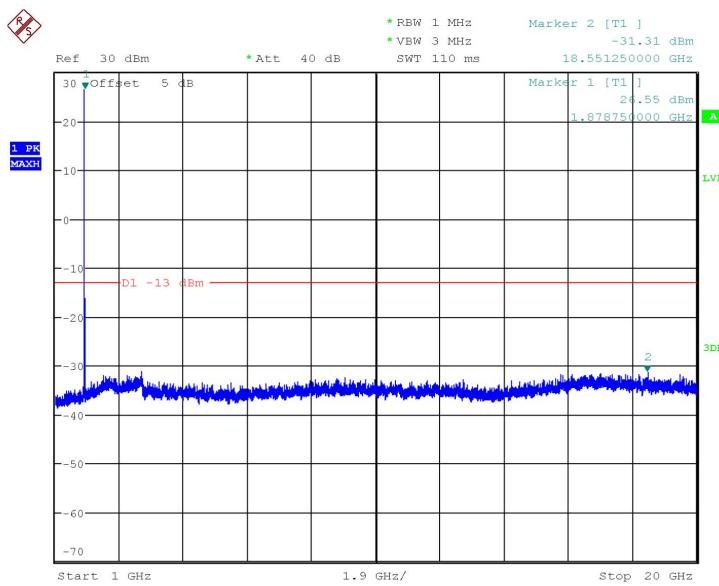
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### Channel 128: 1GHz~20GHz



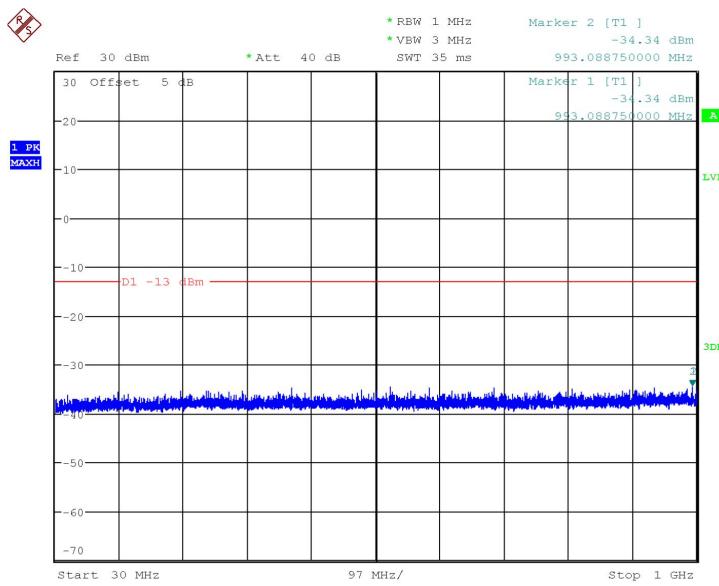
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### Channel 189: 30MHz~1GHz



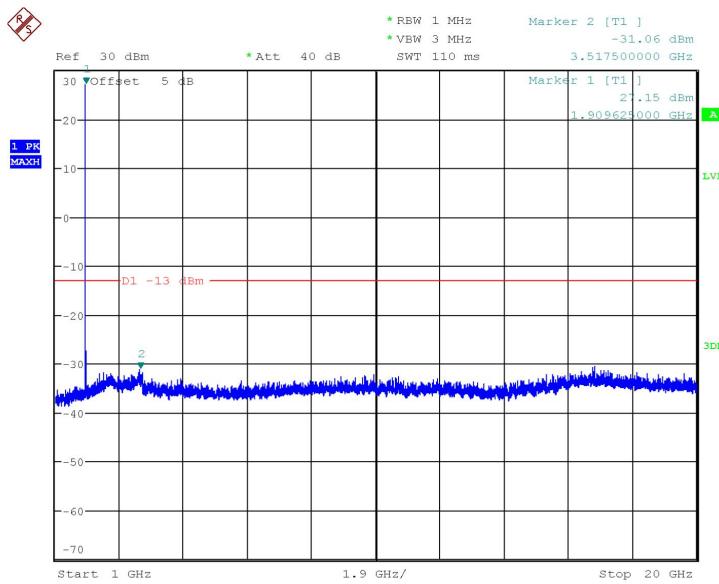
Date: 30.AUG.2018 03:56:49

### Channel 189: 1GHz~20GHz



Date: 30.AUG.2018 03:58:25

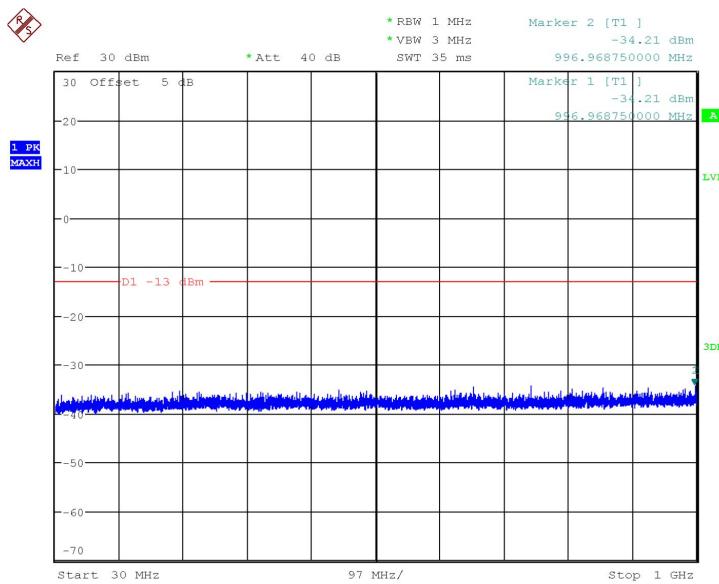
### Channel 251: 30MHz~1GHz



Date: 30.AUG.2018 03:58:47

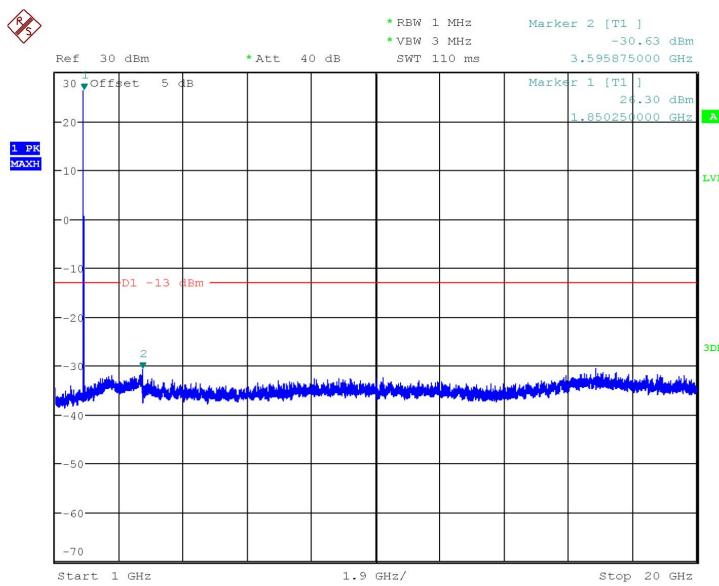
## Channel 251: 1GHz~20GHz

### A7.1.2.2. GSM1900



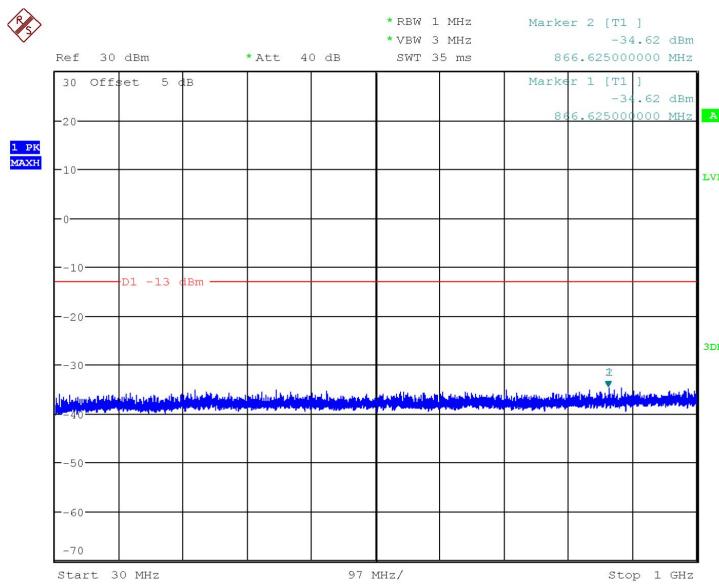
Date: 30.AUG.2018 03:57:26

## Channel 512: 30MHz~1GHz



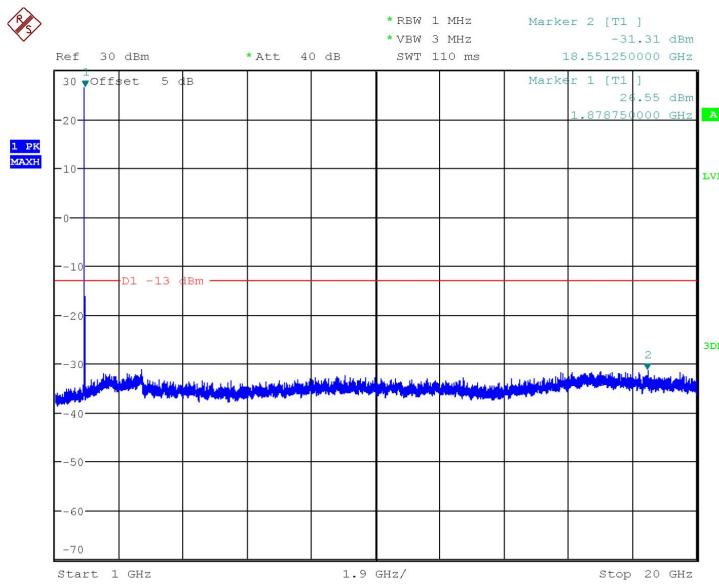
Date: 30.AUG.2018 03:57:48

### Channel 512: 1GHz~20GHz



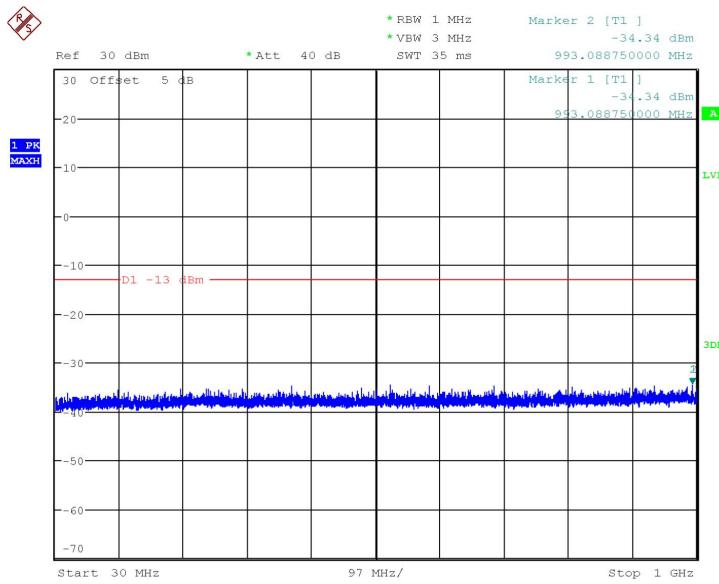
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### Channel 661: 30MHz~1GHz



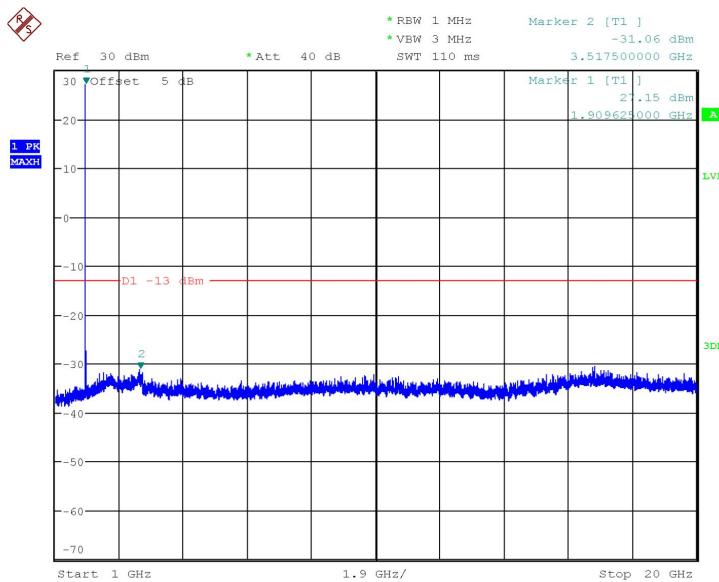
Date: 30.AUG.2018 03:56:49

### Channel 661: 1GHz~20GHz



Date: 30.AUG.2018 03:58:25

### Channel 810: 30MHz~1GHz



Date: 30.AUG.2018 03:58:47

**Channel 810: 1GHz~20GHz****Conclusion: PASS****A7.2. WCDMA Measurement Method and test procedures**

The following steps outline the procedure used to measure the conducted emissions from the EUT.

1. Determine frequency range for measurements: From CFR 2.1057 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency. For the equipment of WCDMA Band II, this equates to a frequency range of 30 MHz to 19.1 GHz, data taken from 30 MHz to 20 GHz. For WCDMA Band V, data taken from 30 MHz to 10GHz.
2. The sweep time is set automatically by instrument itself. That should be the optimal sweep time for the span and the RBW. If the sweep time is too short, that is sweep is too fast, the sweep result is not accurate; If the sweep time is too long, that is sweep is too low, some frequency components may be lost. The instrument will give a optimal sweep time according the selected span and RBW.
3. The procedure to get the conducted spurious emission is as follows:  
The trace mode is set to MaxHold to get the highest signal at each frequency;  
Wait 25 seconds;  
Get the result.
4. Determine EUT transmit frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.

**WCDMA Band II Transmitter**

Channel	Frequency (MHz)
9262	1852.40

9400	1880.00
9538	1907.60

**WCDMA Band V Transmitter**

Channel	Frequency (MHz)
4132	826.40
4183	836.60
4233	846.60

**A 7.2.1. Measurement Limit**

Part 24.238 and Part 22.917 specify that the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

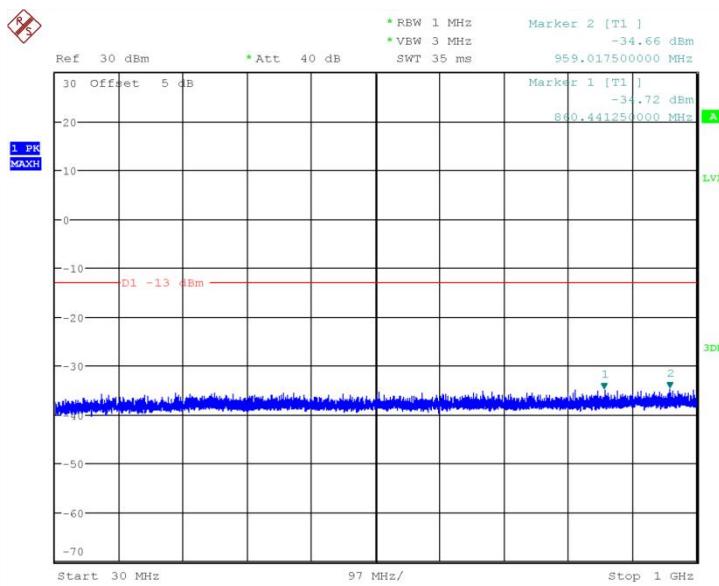
The specification that emissions shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log(P)$  dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

**A 7.2.2. Measurement result**

**Spurious emission limit -13dBm.**

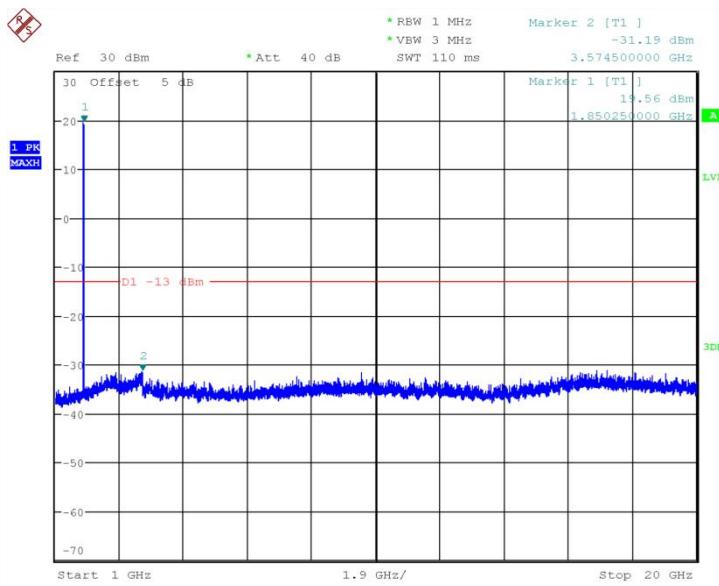
**Note: peak above the limit line is the carrier frequency.**

**A 7.2.2.1. WCDMA Band II**



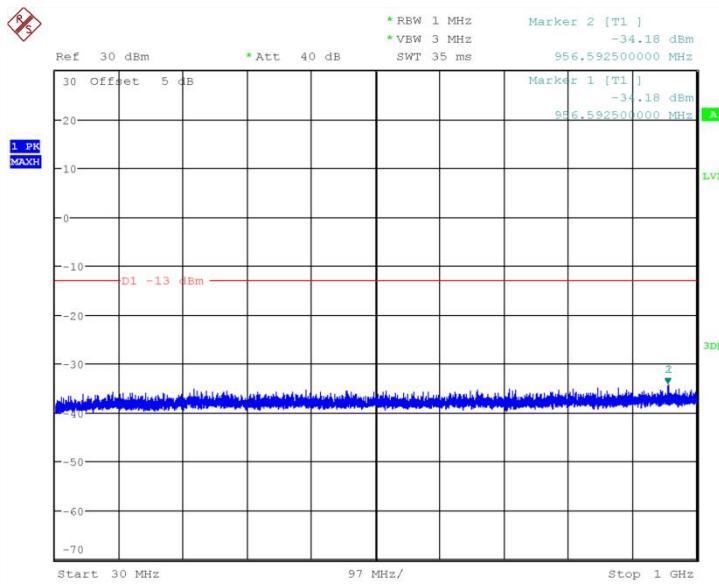
Date: 29.AUG.2018 12:07:22

### Channel 9262: 30MHz~1GHz



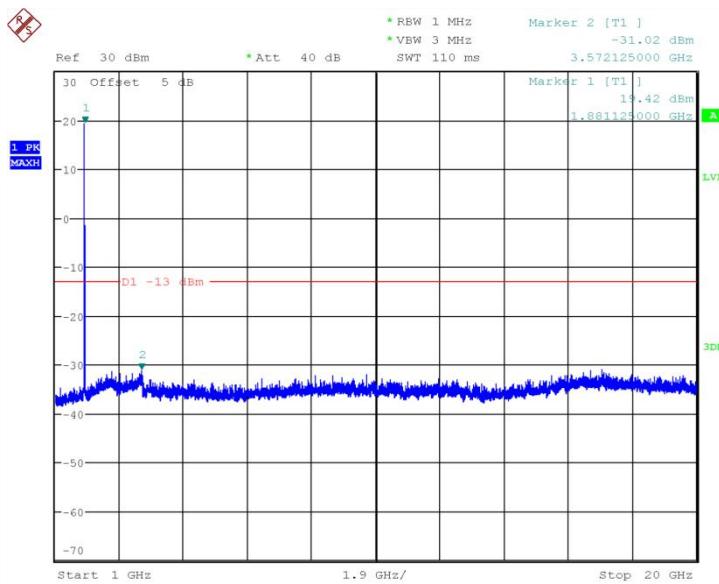
Date: 29.AUG.2018 12:07:45

### Channel 9262:1GHz~20GHz



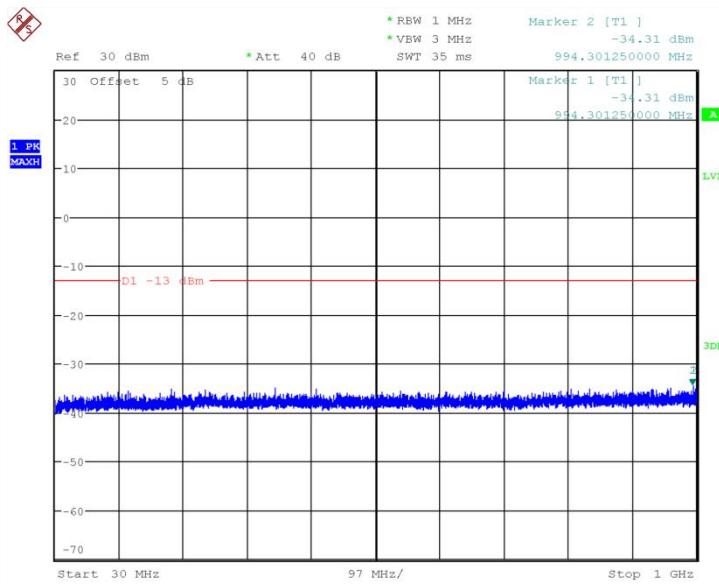
Date: 29.AUG.2018 12:06:15

### Channel 9400: 30MHz~1GHz



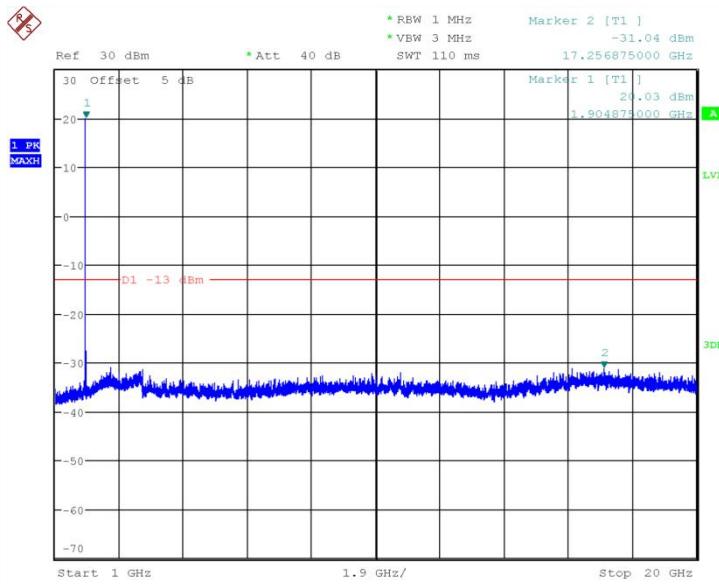
Date: 29.AUG.2018 12:06:38

### Channel 9400:1GHz~20GHz



Date: 29.AUG.2018 12:08:29

### Channel 9538: 30MHz~1GHz

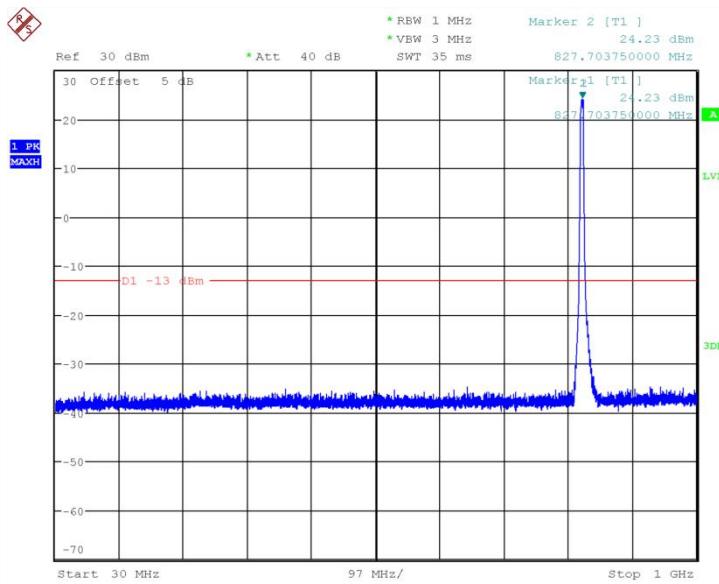


Date: 29.AUG.2018 12:08:51

### Channel 9538:1GHz~20GHz

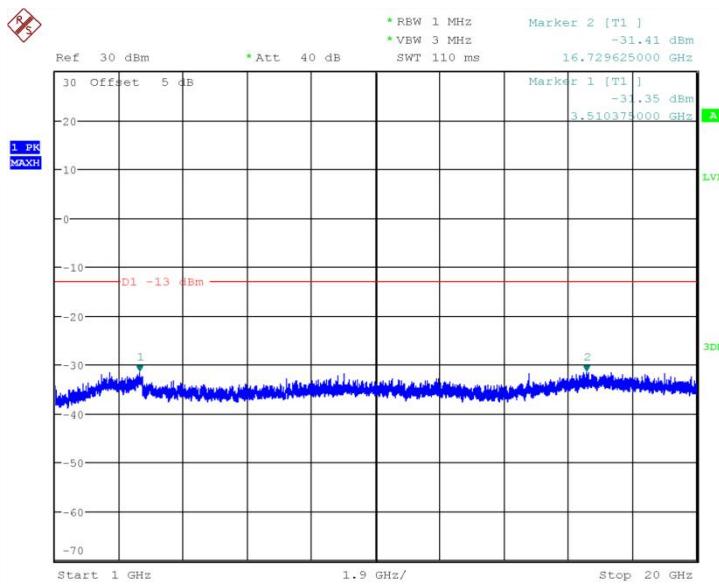
**Conclusion: PASS**

#### A 7.2.2.3. WCDMA Band V



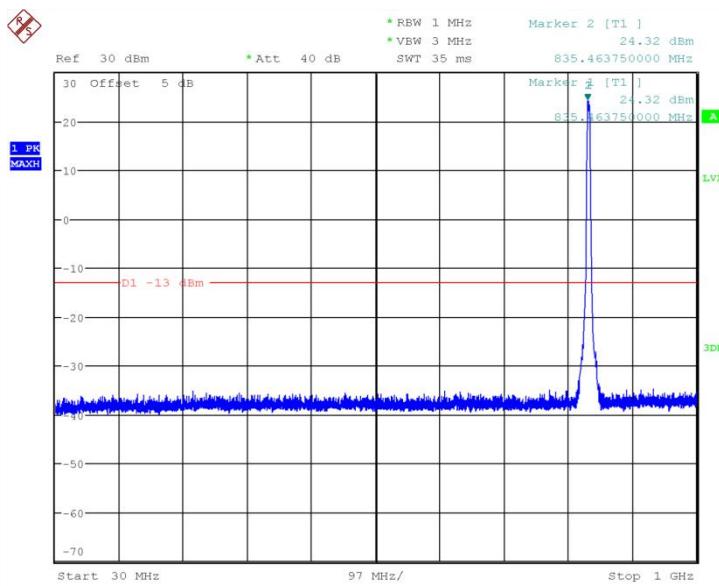
Date: 29.AUG.2018 12:10:51

### Channel 4132: 30MHz~1GHz



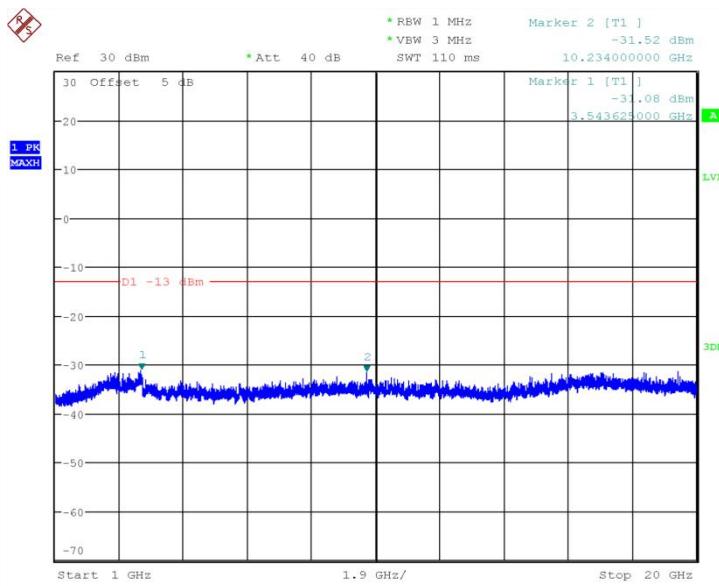
Date: 29.AUG.2018 12:11:14

### Channel 4132:1GHz~20GHz



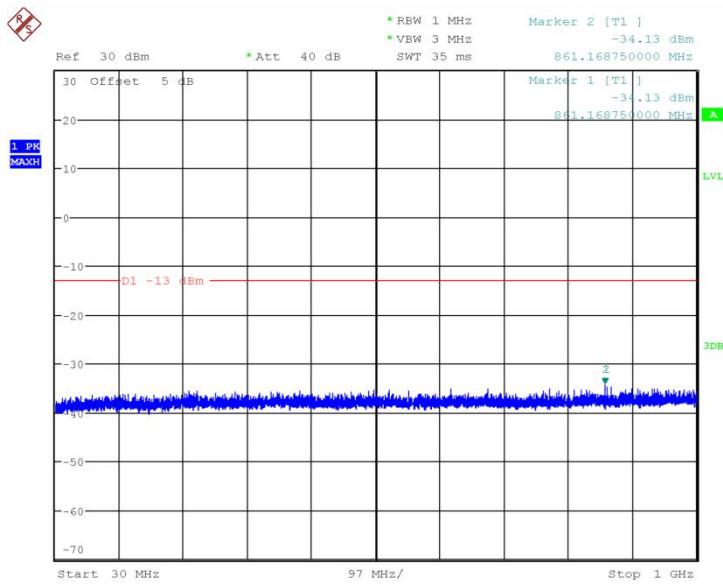
Date: 29.AUG.2018 12:09:44

### Channel 4183: 30MHz~1GHz



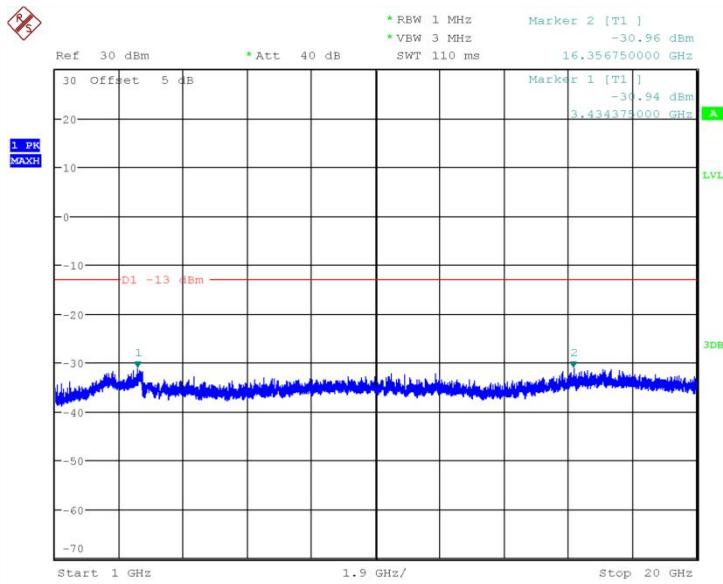
Date: 29.AUG.2018 12:10:07

### Channel 4183:1GHz~20GHz



Date: 29.AUG.2018 12:11:58

### Channel 4233: 30MHz~1GHz



Date: 29.AUG.2018 12:12:21

### Channel 4233:1GHz~20GHz

**Conclusion: PASS**

## ANNEX A.8. RADIATED

### A.8.1. ERP

#### A.8.1.1. GSM ERP

##### A.8.1.1.1. Description

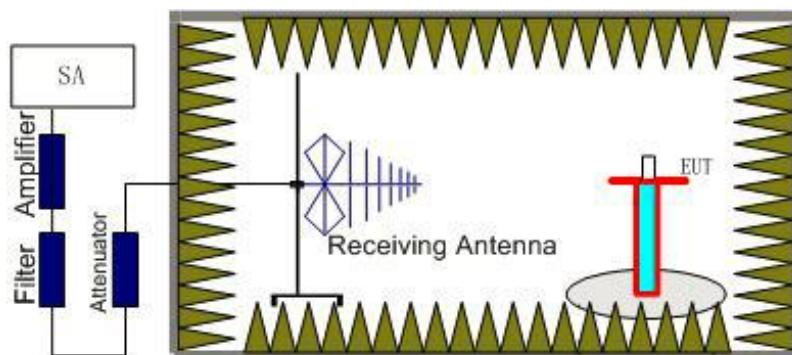
This is the test for the maximum radiated power from the EUT.

Rule Part 24.232(c) specifies, "Mobile/portable stations are limited to 2 watts e.i.r.p. Peak power" and 24.232(c) specifies that "Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage." Rule Part 22.913(a) specifies "The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts."

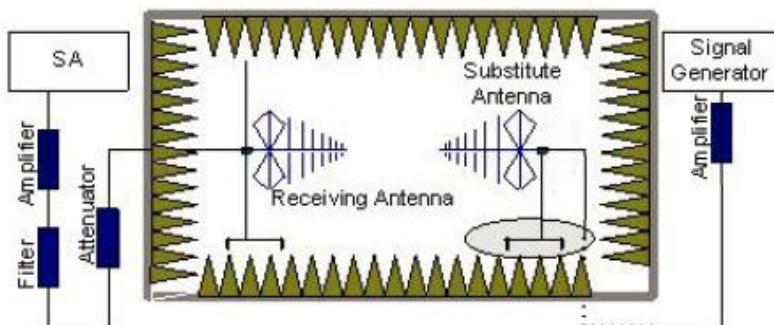
##### A.8.1.1.2. Method of Measurement

The measurements procedures in TIA-603E-2016 are used.

1. EUT was placed on a 1.5 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.5m. The test setup refers to figure below. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in three channels (High, Middle, Low) were measured with peak detector.



2. The EUT is then put into continuously transmitting mode at its maximum power level during the test. And the maximum value of the receiver should be recorded as (Pr).
3. The EUT shall be replaced by a substitution antenna. The test setup refers to figure below.



In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power ( $P_{Mea}$ ) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded ( $P_r$ ). The power of signal source ( $P_{Mea}$ ) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

4. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna.

The cable loss ( $P_{cl}$ ), the Substitution Antenna Gain ( $G_a$ ) and the Amplifier Gain ( $P_{Ag}$ ) should be recorded after test.

The measurement results are obtained as described below:

$$\text{Power(EIRP)} = P_{Mea} + P_{Ag} - P_{cl} + G_a$$

5. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15dBi) and known input power.

6. ERP can be calculated from EIRP by subtracting the gain of the dipole,  $\text{ERP} = \text{EIRP} - 2.15\text{dBi}$ .

#### **A.8.1.1.3 GSM 850-ERP 22.913(a)**

##### **A.8.1.1.3.1 Limits**

	<b>Power Step</b>	<b>Burst Peak ERP (dBm)</b>
GPRS	3	$\leq 38.45\text{dBm}$ (7W)
EDGE	6	$\leq 38.45\text{dBm}$ (7W)

##### **A.8.1.1.3.2 Measurement result**

###### **GPRS(GMSK)**

Frequency (MHz)	$P_{Mea}$ (dBm)	$P_{cl}$ (dB)	$P_{Ag}$ (dB)	$G_a$ Antenna Gain(dBd)	PeakERP(dBm)	Polarization
824.2	-6.77	3.1	37	3.11	30.24	H
836.6	-7.51	3.1	37	3.11	29.5	H
848.8	-7.46	3.1	37	3.11	29.55	H

###### **EDGE(8PSK)**

Frequency (MHz)	$P_{Mea}$ (dBm)	$P_{cl}$ (dB)	$P_{Ag}$ (dB)	$G_a$ Antenna Gain(dBd)	PeakERP(dBm)	Polarization
824.2	-10.68	3.1	37	3.11	26.33	H
836.6	-9.92	3.1	37	3.11	27.09	H
848.8	-8.62	3.1	37	3.11	28.39	H

###### **Frequency: 824.2MHz**

$$\begin{aligned}\text{Peak ERP(dBm)} &= P_{\text{Mea}}(-8.62\text{dBm}) - P_{\text{cl}}(3.1\text{dB}) + P_{\text{Ag}}(37\text{dB}) + G_a(3.11\text{dB}) \\ &= 28.39\text{dBm}\end{aligned}$$

Note: ANALYZER SETTINGS: RBW = VBW = 3MHz

#### A.8.1.1.4 PCS 1900-EIRP 24.232(c)

##### A.8.1.1.4.1 Limits

	Power Step	Burst Peak EIRP (dBm)
GPRS	3	≤33dBm (2W)
EDGE	6	≤33dBm (2W)

##### A.8.1.1.4.2 Measurement result

###### GPRS(GMSK)

Frequency (MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)	P <sub>Ag</sub> (dB)	G <sub>a</sub> Antenna Gain(dBi)	PeakEIRP(dBm)	Polarization
1850.2	-6.41	4.6	36	4.7	29.69	V
1880.0	-4.95	4.6	35.6	4.7	30.75	H
1909.8	-4.85	4.7	36	4.7	31.15	V

###### EDGE(8PSK)

Frequency (MHz)	P <sub>Mea</sub> (dBm)	P <sub>cl</sub> (dB)	P <sub>Ag</sub> (dB)	G <sub>a</sub> Antenna Gain(dBi)	PeakEIRP(dBm)	Polarization
1850.2	-7.77	4.6	36	4.7	28.33	V
1880.0	-7.09	4.6	35.6	4.7	28.61	H
1909.8	-7.84	4.7	36	4.7	28.16	V

Frequency: 1850.2MHz

$$\text{Peak EIRP(dBm)} = P_{\text{Mea}}(-7.84\text{dBm}) - P_{\text{cl}}(4.6\text{dB}) + P_{\text{Ag}}(36\text{dB}) + G_a(4.7\text{dB}) = 28.16\text{dBm}$$

ANALYZER SETTINGS: RBW = VBW = 3MHz

#### A.8.1.2. WCDMA ERP

##### A.8.1.2.1. Description

This is the test for the maximum radiated power from the EUT.

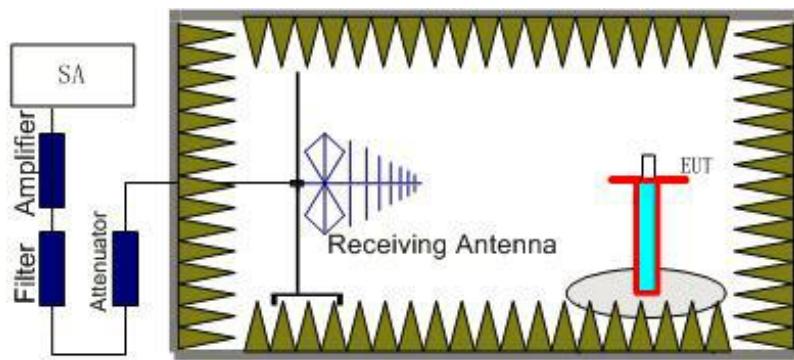
Rule Part 24.232(c) specifies, "Mobile/portable stations are limited to 2 watts e.i.r.p. Peak power" and 24.232(c) specifies that "Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent

voltage."Rule Part 22.913(a) specifies " The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts."

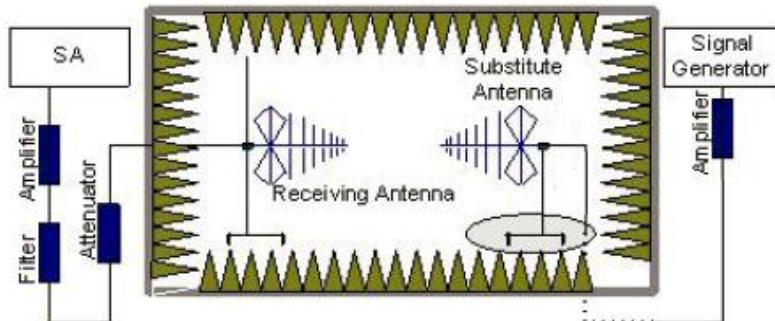
#### A.8.1.2.2. Method of Measurement

The measurements procedures in TIA-603E-2016 are used.

1. EUT was placed on a 1.5 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.5m. The test setup refers to figure below. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in three channels (High, Middle, Low) were measured with peak detector.



2. The EUT is then put into continuously transmitting mode at its maximum power level during the test. And the maximum value of the receiver should be recorded as (Pr).
3. The EUT shall be replaced by a substitution antenna. The test setup refers to figure below.



In the chamber, a substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power ( $P_{Mea}$ ) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded ( $P_r$ ). The power of signal source ( $P_{Mea}$ ) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

4. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna.

The cable loss ( $P_{cl}$ ), the Substitution Antenna Gain ( $G_a$ ) and the Amplifier Gain ( $P_{Ag}$ ) should be recorded after test.

The measurement results are obtained as described below:

$$\text{Power(EIRP)} = P_{\text{Mea}} + P_{\text{Ag}} - P_{\text{cl}} + G_a$$

5. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.

6. ERP can be calculated from EIRP by subtracting the gain of the dipole,  $\text{ERP} = \text{EIRP} - 2.15 \text{ dBi}$ .

#### A.8.1.2.4 WCDMA Band II-ERP

		Burst Peak EIRP (dBm)
WCDMA Band II		$\leq 33 \text{ dBm (2W)}$

#### A.8.1.2.3.2 Measurement result

Frequency (MHz)	$P_{\text{Mea}}(\text{dBm})$	$P_{\text{cl}}(\text{dB})$	$P_{\text{Ag}}(\text{dB})$	$G_a$ Antenna Gain(dBi)	PeakEIRP(dBm)	Polarization
1852.4	-19.51	3.54	43.8	2.9	23.65	V
1880.0	-18.97	3.54	43.8	2.9	24.19	H
1907.6	-18.53	3.54	43.8	2.9	24.63	V

**Frequency: 1852.40MHz**

$$\text{Peak EIRP(dBm)} = P_{\text{Mea}}(-18.53 \text{ dBm}) - P_{\text{cl}}(3.54 \text{ dB}) + P_{\text{Ag}}(43.8 \text{ dB}) + G_a(2.9 \text{ dBi}) = 24.63 \text{ dBm}$$

**ANALYZER SETTINGS: RBW = VBW = 5MHz**

#### A.8.1.2.4.1 Limits

		Burst Peak EIRP (dBm)
WCDMA Band V		$\leq 38.45 \text{ dBm (7W)}$

#### A.8.1.2.4.2 Measurement result

Frequency (MHz)	$P_{\text{Mea}}(\text{dBm})$	$P_{\text{cl}}(\text{dB})$	$P_{\text{Ag}}(\text{dB})$	$G_a$ Antenna Gain(dBd)	PeakERP(dBm)	Polarization
826.4	-15.96	3.1	37	2.9	20.84	H
836.6	-16.62	3.1	37	2.9	20.18	H
846.6	-14.73	3.1	37	2.9	22.07	H

**Frequency: 826.4 MHz**

$$\text{Peak ERP(dBm)} = P_{\text{Mea}}(-14.73 \text{ dBm}) - P_{\text{cl}}(3.1 \text{ dB}) + P_{\text{Ag}}(37 \text{ dB}) + G_a(2.9 \text{ dBd}) = 22.07 \text{ dBm}$$

**ANALYZER SETTINGS: RBW = VBW = 5MHz**

**Note: the EUT was displayed in several different direction, the worst cases were shown.**

## A.8.2 EMISSION LIMIT (§2.1051/§22.917§24.238)

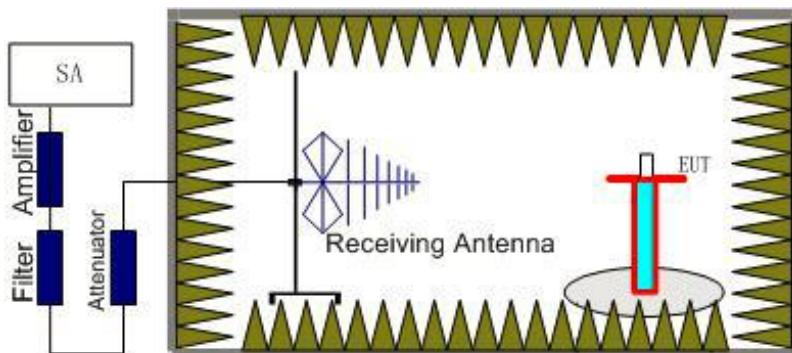
### A.8.2.1 GSM Measurement Method

The measurement procedures in TIA-603E-2016 are used.

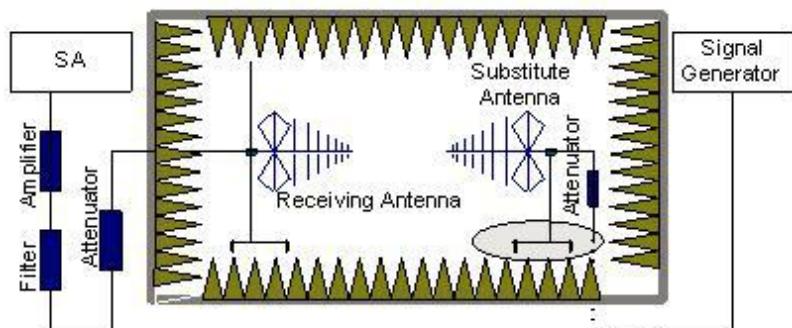
The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 1910 MHz. The resolution bandwidth is set as outlined in Part 24.238 and Part 22.917. The spectrum is scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of PCS1900 and GSM850.

### A.8.2.2 The procedure of radiated spurious emissions is as follows:

1. EUT was placed on a 1.5 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.5m. The test setup refers to figure below. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all non-harmonic and harmonics of the transmit frequency through the 10<sup>th</sup> harmonic were measured with peak detector.



2. The EUT is then put into continuously transmitting mode at its maximum power level during the test. And the maximum value of the receiver should be recorded as (Pr).
3. The EUT shall be replaced by a substitution antenna. The test setup refers to figure below.



In the chamber, a substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power ( $P_{Mea}$ ) is applied to the input of the

substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded ( $P_r$ ). The power of signal source ( $P_{Mea}$ ) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

4. The Path loss ( $P_{pl}$ ) between the Signal Source with the Substitution Antenna and the Substitution Antenna Gain ( $G_a$ ) should be recorded after test.

A amplifier should be connected in for the test.

The Path loss ( $P_{pl}$ ) is the summation of the cable loss .

The measurement results are obtained as described below:

Power(EIRP)= $P_{Mea}$ -  $P_{pl}$ +  $G_a$

5. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.

6. ERP can be calculated from EIRP by subtracting the gain of the dipole,  $ERP = EIRP - 2.15\text{dBi}$

#### **A.8.2.3 Measurement Limit**

Part 24.238 and Part 22.917 specify that the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power ( $P$ ) by a factor of at least  $43 + 10 \log(P)$  dB.

The specification that emissions shall be attenuated below the transmitter power ( $P$ ) by at least  $43 + 10 \log(P)$  dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

#### **A.8.2.4 Measurement Results**

Radiated emissions measurements were made only at the upper, middle, and lower carrier frequencies of the PCS1900 band (1850.2 MHz, 1880 MHz and 1909.8 MHz) and GSM850 band (824.2MHz, 836.6MHz, 848.8MHz) . It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a carrier in one block of the PCS1900 ,GSM850 into any of the other blocks. The equipment must still, however, meet emissions requirements with the carrier at all frequencies over which it is capable of operating and it is the manufacturer's responsibility to verify this.

#### **A.8.2.5 Measurement Results**

##### **Main supply**

##### **Measurements results:**

Frequency	Channel	Frequency Range	Result
GSM850	Low	30MHz~10GHz	P
	Middle	30MHz~10GHz	P
	High	30MHz~10GHz	P

<b>GSM1900</b>	Low	30MHz~20GHz	P
	Middle	30MHz~20GHz	P
	High	30MHz~20GHz	P

**Secondary supply**
**Measurements results:**

Frequency	Channel	Frequency Range	Result
<b>GSM850</b>	Low	30MHz~10GHz	P
	Middle	30MHz~10GHz	P
	High	30MHz~10GHz	P

**Main supply**
**GPRS Mode Channel 128**
**Final result:**

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit (dBm)	Polarization
1647.9	-28.07	4.3	2.9	-29.47	-13	H
2472.9	-30.98	5.3	3.7	-32.58	-13	V
4120.4	-45.96	7.0	7.7	-45.26	-13	V
4946.5	-49.45	7.7	9.0	-48.15	-13	H
5785.4	-50.22	8.4	10.5	-48.12	-13	V
6592.3	-48.9	9.1	11.5	-46.5	-13	V

**Note:**
**GPRS 850, CH128**

$$\text{Power(ERP)} = \text{Pmea} - \text{Pcl} + \text{Ga} = -48.9 - 9.1 + 11.5 = -46.5 \text{ dbm}$$

**This method Applicable to the following table.**
**GPRS Mode Channel 189**
**Final result:**

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit (dBm)	Polarization

1672.5	-27.99	4.3	2.9	-29.39	-13	V
2509.3	-36.22	5.4	3.7	-37.92	-13	V
3346.2	-46.62	6.2	4.7	-48.12	-13	H
4182.7	-45.2	7.0	7.7	-44.5	-13	V
5408.1	-49.82	8.1	9.5	-48.42	-13	V
6201.5	-49.98	8.7	10.8	-47.88	-13	V

**GPRS Mode Channel 251**
**Final result:**

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit (dBm)	Polarization
1696.1	-22.4	4.4	2.9	-23.9	-13	H
2546.8	-28.71	5.4	3.7	-30.41	-13	V
3394.6	-39.19	6.3	4.7	-40.79	-13	V
4243.8	-42.77	7.1	7.7	-42.17	-13	V
5091.9	-49.32	7.9	9.0	-48.22	-13	V
5850.0	-51.67	8.4	10.5	-49.57	-13	H

**EGPRS Mode Channel 128**
**Final result:**

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit (dBm)	Polarization
1521.4	-43.61	4.1	3.4	-44.31	-13	V
2649.6	-35.84	5.5	4.1	-37.24	-13	H

3579.2	-47.11	6.5	4.7	-48.91	-13	H
4545.0	-48.29	7.4	7.3	-48.39	-13	H
5141.5	-48.61	7.9	8.7	-47.81	-13	V
5831.5	-50.59	8.4	10.5	-48.49	-13	H

**This method Applicable to the following table.**

**EGPRS Mode Channel 189****Final result:**

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit (dBm)	Polarization
1818.2	-41.69	4.6	2.9	-43.39	-13	H
2677.5	-35.86	5.6	4.1	-37.36	-13	H
3203.1	-47.53	6.1	4.7	-48.93	-13	H
4389.2	-48.87	7.3	7.3	-48.87	-13	H
5342.3	-48.94	8.1	8.7	-48.34	-13	H
6373.8	-49.54	8.8	10.8	-47.54	-13	V

**EGPRS Mode Channel 251****Final result:**

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit (dBm)	Polarization
1680.0	-43.49	4.4	2.9	-44.99	-13	H
2716.1	-35.7	5.6	4.1	-37.2	-13	V
3570.0	-47.12	6.4	4.7	-48.82	-13	V

4569.2	-47.01	7.4	7.3	-47.11	-13	H
5986.2	-49.26	8.6	10.4	-47.46	-13	H
6456.9	-49.26	8.9	11.5	-46.66	-13	V

**GPRS Mode Channel 512**
**Final result:**

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit (dBm)	Polarization
3700.2	-40.83	6.6	7.7	-39.73	-13	V
5550.6	-49.86	8.2	9.5	-48.56	-13	V
7400.4	-48.76	9.7	14.6	-43.86	-13	V
9664.8	-53.24	10.9	18.3	-45.84	-13	V
11221.2	-49.19	12.1	18.5	-42.79	-13	V
14289.6	-48.4	13.6	23.5	-38.5	-13	H

**GPRS Mode Channel 661**
**Final result:**

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit (dBm)	Polarization
3760.2	-44.71	6.6	7.7	-43.61	-13	V
5299.2	-52.75	8.0	8.7	-52.05	-13	V
7519.2	-50.15	9.7	14.6	-45.25	-13	V
9436.8	-54.46	10.7	18.6	-46.56	-13	V

11613.6	-49.02	12.2	18.1	-43.12	-13	V
14296.8	-48.5	13.6	23.5	-38.6	-13	H

**GPRS Mode Channel 810****Final result:**

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit (dBm)	Polarization
3819.0	-43.91	6.7	7.7	-42.91	-13	V
5730.0	-52.33	8.5	10.5	-50.33	-13	H
7170.0	-53.86	9.4	13.7	-49.56	-13	V
8881.2	-55.71	10.4	18.3	-47.81	-13	V
10798.8	-49.64	11.7	17.3	-44.04	-13	H
12944.4	-46.97	13.0	20.2	-39.77	-13	V

**Conclusion: PASS****Note: the EUT was displayed in several different direction, the worst cases were shown.****EGPRS Mode Channel 512****Final result:**

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit (dBm)	Polarization
3700.2	-42.63	6.6	7.7	-41.53	-13	V
5550.6	-47.84	8.2	9.5	-46.54	-13	H
7400.4	-48.56	9.7	14.6	-43.66	-13	V
9228.0	-53.95	10.6	18.5	-46.05	-13	H
11652.0	-47.93	12.4	17.6	-42.73	-13	H

14272.8	-47.75	13.7	23.5	-37.95	-13	H
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**EGPRS Mode Channel 661****Final result:**

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit (dBm)	Polarization
3759.6	-45.41	6.6	7.7	-44.31	-13	H
5640.0	-50.73	8.3	10.5	-48.53	-13	H
7519.2	-49.28	9.7	14.6	-44.38	-13	V
9962.4	-52.12	11.2	17.6	-45.72	-13	H
12811.2	-46.84	12.5	19.2	-40.14	-13	V
16806.0	-39.95	15.8	20.0	-35.75	-13	V

**EGPRS Mode Channel 810****Final result:**

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit (dBm)	Polarization
3819.6	-45.51	6.7	7.7	-44.51	-13	V
5729.4	-50.95	8.5	10.5	-48.95	-13	V
7639.2	-51.32	9.7	15.3	-45.72	-13	V
9548.4	-52.77	10.7	18.6	-44.87	-13	V
12888.0	-46.8	13.0	20.2	-39.6	-13	V
14718.0	-47.4	14.0	23.3	-38.1	-13	V

**Conclusion: PASS**

**Secondary supply**  
**GPRS Mode Channel 128**  
**Final result:**

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit (dBm)	Polarization
1855.7	-40.56	4.6	2.9	-42.26	-13	H
2698.9	-36.42	5.6	4.1	-37.92	-13	V
3571.2	-46.96	6.4	4.7	-48.66	-13	H
4418.1	-48.84	7.3	7.3	-48.84	-13	H
5859.2	-50.39	8.4	10.5	-48.29	-13	V
8020.0	-52.23	9.9	16.6	-45.53	-13	V

**Note:****GPRS 850, CH128****Power(ERP)= Pmea-Pcl+Ga=-48.9-9.1+11.5=-46.5dbm****This method Applicable to the following table.****GPRS Mode Channel 189****Final result:**

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit (dBm)	Polarization
1785.0	-42.38	4.5	2.9	-43.98	-13	V
2716.1	-35.29	5.6	4.1	-36.79	-13	H
3578.1	-46.89	6.5	4.7	-48.69	-13	V
4227.7	-50.08	7.1	7.7	-49.48	-13	V
5923.8	-49.7	8.5	10.4	-47.8	-13	H
6907.7	-50.16	9.3	12.9	-46.56	-13	V

**GPRS Mode Channel 251****Final result:**

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit (dBm)	Polarization
1830.0	-41.2	4.6	2.9	-42.9	-13	H
2590.7	-35.11	5.5	3.7	-36.91	-13	V
3580.4	-46.73	6.5	4.7	-48.53	-13	V
4553.1	-48.42	7.4	7.3	-48.52	-13	V
6036.9	-48.77	8.6	10.4	-46.97	-13	H
7306.2	-50.54	9.6	13.7	-46.44	-13	V

**EGPRS Mode Channel 128****Final result:**

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit (dBm)	Polarization
1758.2	-42.11	4.5	2.9	-43.71	-13	V
2450.4	-36.78	5.3	3.7	-38.38	-13	H
3393.5	-47.64	6.3	4.7	-49.24	-13	H
4663.8	-48.52	7.5	7.9	-48.12	-13	H
5876.5	-50.03	8.5	10.4	-48.13	-13	V
6955.4	-49.84	9.3	12.9	-46.24	-13	H

**This method Applicable to the following table.****EGPRS Mode Channel 189****Final result:**

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit (dBm)	Polarization
1837.5	-40.73	4.6	2.9	-42.43	-13	H
2817.9	-34.61	5.7	4.1	-36.21	-13	H
3364.6	-48.49	6.2	4.7	-49.99	-13	V
4445.8	-48.91	7.3	7.3	-48.91	-13	V
5233.8	-48.69	8.0	8.7	-47.99	-13	H
6383.1	-49.4	8.9	11.5	-46.8	-13	H

**EGPRS Mode Channel 251****Final result:**

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit (dBm)	Polarization
1852.5	-41.07	4.6	2.9	-42.77	-13	H
2659.3	-35.89	5.5	4.1	-37.29	-13	H
3421.2	-48.04	6.3	4.7	-49.64	-13	V
3575.8	-47.05	6.5	4.7	-48.85	-13	H
4795.4	-48.96	7.6	7.9	-48.66	-13	V
6015.4	-49.45	8.6	10.4	-47.65	-13	H

**Note: the EUT was displayed in several different direction, the worst cases were shown.**

**A.7.2.2. WCDMA Measurement Method**

The measurements procedures in TIA-603E-2016 are used.

The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment. The resolution bandwidth is set as outlined in Part 24.238 and Part 24.917. The spectrum is scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of WCDMA Band V.

**The procedure of radiated spurious emissions is the same like GSM.**

**A.7.2.2.1. Measurement Limit**

Part 24.238 and Part 22.917 specify that the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

The specification that emissions shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log(P)$  dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

**A.7.2.2.2. Measurement Results**

Radiated emissions measurements were made only at the upper, middle, and lower carrier frequencies of the WCDMA Band V (826.4MHz, 836.6MHz and 846.6MHz) . It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a carrier in one block of the WCDMA Band V into any of the other blocks. The equipment must still, however, meet emissions requirements with the carrier at all frequencies over which it is capable of operating and it is the manufacturer's responsibility to verify this.

**A.7.2.2.3. Measurement Results Table****Main supply**

Frequency	Channel	Frequency Range	Result
WCDMA Band II	Low	30MHz~20GHz	P
	Middle	30MHz~20GHz	P
	High	30MHz~20GHz	P
WCDMA Band V	Low	30MHz~20GHz	P
	Middle	30MHz~20GHz	P
	High	30MHz~20GHz	P

**Second supply**

Frequency	Channel	Frequency Range	Result
WCDMA Band II	Low	30MHz~20GHz	P
	Middle	30MHz~20GHz	P
	High	30MHz~20GHz	P

**Main supply**
**WCDMA BAND II Mode Channel 9262**
**Final result:**

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERF (dBm)	Limit (dBm)	Polarization
3706.8	-53.59	6.6	7.7	-52.49	-13	V
5555.6	-51.32	8.2	9.5	-50.02	-13	V
7414.0	-55.18	9.7	14.6	-50.28	-13	V
9267.2	-61.35	10.6	18.5	-53.45	-13	V
10887.2	-57.22	11.8	18.1	-50.92	-13	V
12956.8	-54.94	13.2	20.2	-47.94	-13	H

**WCDMA BAND II Mode Channel 9400**
**Final result:**

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERF (dBm)	Limit (dBm)	Polarization
3758.0	-56.01	6.6	7.7	-54.91	-13	V
4570.0	-56.22	7.4	7.3	-56.32	-13	H
5636.8	-51.87	8.3	10.5	-49.67	-13	V
7519.2	-55.11	9.7	14.6	-50.21	-13	H

9401.6	-60.59	10.7	18.6	-52.69	-13	V
11662.2	-55.51	12.4	17.6	-50.31	-13	V

**WCDMA BAND II Mode Channel 9538****Final result:**

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit (dBm)	Polarization
3813.6	-58.95	6.7	7.7	-57.95	-13	V
5720.0	-53.49	8.5	10.5	-51.49	-13	V
7626.8	-58.88	9.7	15.3	-53.28	-13	H
9425.6	-61.01	10.7	18.6	-53.11	-13	V
10787.2	-57.13	11.7	17.3	-51.53	-13	H
12746.2	-55.17	12.7	19.2	-48.67	-13	V

**WCDMA BAND V Mode Channel 4132****Final result:**

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit (dBm)	Polarization
1512.5	-58.99	4.1	3.4	-59.69	-13	V
2227.3	-52.84	5.1	3.3	-54.64	-13	H
3608.8	-59.28	6.5	4.7	-61.08	-13	V
4526.4	-59.12	7.4	7.3	-59.22	-13	V
5472.0	-60.22	8.1	9.5	-58.82	-13	H

6392.8	-60.4	8.9	11.5	-57.8	-13	V
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**WCDMA BAND V Mode Channel 4183****Final result:**

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit (dBm)	Polarization
1845.0	-54.69	4.6	2.9	-56.39	-13	H
2548.1	-49.65	5.4	3.7	-51.35	-13	V
3602.4	-59.07	6.5	4.7	-60.87	-13	H
4550.0	-58.55	7.4	7.3	-58.65	-13	H
5224.8	-59.42	8.0	8.7	-58.72	-13	V
6422.8	-59.75	8.9	11.5	-57.15	-13	H

**WCDMA BAND V Mode Channel 4233****Final result:**

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit (dBm)	Polarization
1511.8	-58.99	4.1	3.4	-59.69	-13	V
2240.0	-52.26	5.1	3.3	-54.06	-13	H
3687.2	-61.26	6.6	7.7	-60.16	-13	H
4503.2	-59	7.3	7.3	-59	-13	H
5940.8	-60.45	8.5	10.4	-58.55	-13	V
7785.4	-62.33	9.9	15.3	-56.93	-13	V

**Second supply****WCDMA BAND II Mode Channel 9262****Final result:**

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit (dBm)	Polarization
3703.2	-52.4	6.6	7.7	-51.3	-13	V
5554.4	-51.27	8.2	9.5	-49.97	-13	V
7406.8	-54.67	9.7	14.6	-49.77	-13	V
8905.2	-62.26	10.4	18.3	-54.36	-13	V
10793.2	-56.94	11.7	17.3	-51.34	-13	V
12561.4	-55.24	12.8	18.7	-49.34	-13	V

**WCDMA BAND II Mode Channel 9400****Final result:**

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit (dBm)	Polarization
3762.4	-49.54	6.6	7.7	-48.44	-13	V
5636.8	-54.02	8.3	10.5	-51.82	-13	V
7515.6	-55.2	9.7	14.6	-50.3	-13	V
9139.2	-62.41	10.5	18.5	-54.41	-13	V
10683.2	-57.2	11.7	17.3	-51.6	-13	H
14600.1	-55.63	14.0	22.7	-46.93	-13	H

**WCDMA BAND II Mode Channel 9538****Final result:**

Frequency (MHz)	PMea (dBm)	Pcl (dBm)	Ga (dBd)	Peak ERP (dBm)	Limit (dBm)	Polarization
3816.8	-50.12	6.7	7.7	-49.12	-13	V
5720.0	-49.93	8.5	10.5	-47.93	-13	V
7626.0	-56.46	9.7	15.3	-50.86	-13	V
8974.8	-62.56	10.4	18.3	-54.66	-13	V
12525.3	-53.86	12.7	18.7	-47.86	-13	V
15964.0	-50.71	15.0	20.4	-45.31	-13	H

**Conclusion: PASS**

Note: the EUT was displayed in several different direction, the worst cases were shown.

## ANNEX B. Deviations from Prescribed Test Methods

No deviation from Prescribed Test Methods.

\*\*\*\*\*End Of Report\*\*\*\*\*